

Claims

What is claimed is:

1 1. A processor-implemented method for providing a desired level of performance for a
2 wireless network, the method comprising the steps of:

3 applying an optimization process to a set of information characterizing the network,
4 the optimization process comprising at least a pre-frequency-assignment optimization stage, the pre-
5 frequency-assignment optimization stage being applied prior to assignment of frequencies to one or
6 more communication channels of the wireless network; and

7 utilizing an output of the optimization process to determine at least one operating
8 parameter of the wireless network.

1 2. The method of claim 1 wherein the optimization process further comprises a multi-stage
2 optimization process having at least the pre-frequency-assignment optimization stage followed by
3 a frequency assignment stage.

1 3. The method of claim 2 wherein the pre-frequency-assignment optimization stage and the
2 frequency assignment stage are repeated in an iterative manner.

1 4. The method of claim 2 wherein the frequency assignment stage comprises a frequency
2 planning stage.

1 5. The method of claim 1 wherein the wireless network implements a frequency reuse factor
2 greater than one.

1 6. The method of claim 1 wherein the wireless network comprises at least one of a TDMA
2 wireless network, an FDMA wireless network, a CDMA wireless network, an OFDM wireless
3 network, and a TDD wireless network.

1 7. The method of claim 1 wherein the optimization process utilizes a derivative-based
2 optimization of a specified objective function.

1 8. The method of claim 1 wherein the operating parameter of the wireless network
2 comprises at least one of a base station transmit power and an antenna orientation.

1 9. The method of claim 1 wherein the optimization process determines a network
2 configuration for specified values of network capacity and network coverage.

1 10. The method of claim 1 wherein the optimization process generates a graphical display
2 in the form of a tradeoff curve of capacity versus coverage.

1 11. The method of claim 1 wherein the optimization process generates a graphical display
2 in the form of a tradeoff curve of percent carrier-to-interference ratio above threshold versus
3 coverage.

1 12. The method of claim 1 the optimization process generates a graphical display in the form
2 of a set of tradeoff curves comprising one or more tradeoff curves for each of a plurality of frequency
3 plans.

1 13. The method of claim 1 wherein the optimization process assumes a particular frequency
2 pattern in order to compute corresponding co-channel and adjacent-channel interference.

1 14. The method of claim 1 wherein the optimization process assumes a certain probability
2 of co-channel and adjacent-channel likelihood in order to compute corresponding co-channel and
3 adjacent-channel interference.

1 15. The method of claim 1 wherein the optimization process assumes that, for each of a
2 plurality of sectors having more than one frequency, a carrier to interference ratio of every frequency
3 at a given position in that sector is the same.

1 16. The method of claim 1 wherein a number of frequencies per cell sector of the wireless
2 system is known prior to the application of the optimization process, and the process assumes that
3 at least one sector has a different probability of being a co-channel interferer than other sectors.

1 17. The method of claim 1 wherein a number of frequencies per cell sector of the wireless
2 system is unknown prior to the application of the optimization process and all cells are assumed to
3 have the same number of frequencies, and the process assumes that at least one sector has a different
4 probability of being a co-channel interferer than the other sectors.

1 18. The method of claim 1 wherein the optimization process weights interference of each
2 of a plurality of sectors of the system relative to a specified wanted sector by a probability and then
3 sums the weighted interferences.

1 19. The method of claim 1 wherein the optimization process adjusts a probability of a
2 particular system sector being a co-channel or adjacent-channel interferer so as to normalize a level
3 of interference.

1 20. The method of claim 1 wherein an excluded sector or sectors having a zero probability
2 of being a co-channel sector, relative to a given wanted sector in which is located a mobile station
3 for which interference is to be calculated, comprise one or more sectors co-located with the wanted
4 sector in a cell of the network and one or more first-adjacent sectors.

1 21. The method of claim 1 wherein the optimization process defines a carrier to interference
2 ratio for a given position within the network as an average of a set of carrier to interference ratios
3 for different frequencies of the corresponding sector of the network.

1 22. The method of claim 1 wherein the optimization process defines a carrier to interference
2 ratio for a given position within the network as a maximum of a set of carrier to interference ratios
3 for different frequencies of the corresponding sector of the network.

1 23. An apparatus for use in providing a desired level of performance for a wireless network,
2 the apparatus comprising:

3 a processor-based system operative to apply an optimization process to a set of
4 information characterizing the network, the optimization process comprising at least a pre-frequency-
5 assignment optimization stage, the pre-frequency-assignment optimization stage being applied prior
6 to assignment of frequencies to one or more communication channels of the wireless network;

7 wherein an output of the optimization process is utilized to determine at least one
8 operating parameter of the wireless network.

1 24. An apparatus for use in providing a desired level of performance for a wireless network,
2 the apparatus comprising:

3 means for applying an optimization process to a set of information characterizing the
4 network, the optimization process comprising at least a pre-frequency-assignment optimization
5 stage, the pre-frequency-assignment optimization stage being applied prior to assignment of
6 frequencies to one or more communication channels of the wireless network; and

7 means for utilizing an output of the optimization process to determine at least one
8 operating parameter of the wireless network.

1 25. An article of manufacture comprising a machine-readable medium for storing one or
2 more software programs for use in providing a desired level of performance for a wireless network,
3 wherein the one or more programs when executed by a processor-based system perform the step of:
4 applying an optimization process to a set of information characterizing the network,
5 the optimization process comprising at least a pre-frequency-assignment optimization stage, the pre-
6 frequency-assignment optimization stage being applied prior to assignment of frequencies to one or
7 more communication channels of the wireless network;
8 wherein an output of the optimization process is utilized to determine at least one
9 operating parameter of the wireless network.

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